

- 1 - IAP20 Rec'd PCT/PTO 15 JUN 2006

Sequence Listing

<110> Merck Patent GmbH

<120> DNA sequence, and recombinant preparation of group 4 major allergens from cereals

<130> P 03/239

<140> DE 10359351.9

<141> 2003-12-16

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<170> PatentIn version 3.1

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Gln Ala Ala Ala Ala Tyr Ala Pro Val Pro Ala Lys Ala Asp Phe	
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Ser Ser Pro Asp Tyr Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser	
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Arg Trp Ser Ser Pro Gln Asn Val Lys Pro Ile Tyr Ile Ile Thr Pro	
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Gly Ile Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu	
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tcg tac cgg tct gag aaa ccc gag acg ttc gcc gtc gtc gac ctc aac	384
Ser Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn	
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Glu Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn	
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Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val	

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ggc atc gcc gct gag aac gtc atc gac gtc aag gtg gtc gac ccc aac Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn 195	200	205	624	
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Ser His Cys Asn Glu Met Ser Trp Ile Lys Ser Ile Pro Phe Ile His					
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Cys His Ala Ala Val Ser Tyr Ala Ala Pro Val Pro Ala Lys Glu
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gac ttc ttc gga tgc ctg gtg aag gag ata ccg gcc cgcc ctc ctc tac 144
Asp Phe Phe Gly Cys Leu Val Lys Glu Ile Pro Ala Arg Leu Leu Tyr
35 40 45

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Ala Lys Ser Ser Pro Ala Phe Pro Thr Val Leu Ala Gln Thr Ile Arg
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Arg His Gly Val Arg Ile Arg Val Arg Ser Gly Gly His Asp Tyr Glu

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Trp Val Asp Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala
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370 375 380

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Ala Pro Leu Gln Trp Ser Lys Asp Met Tyr Arg Phe Met Glu Pro Tyr
435 440 445

Val Ser Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp
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465 470 475 480

Lys Val Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala
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His His Ala Ala Val Ser Ser Ala Gln Val Pro Ala Lys Asp Asp Phe
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ctg gga tgc ctc gtg aag gag ata ccg gcc cgcc ctc ctc ttc gcc aag 144

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Ser	Ser	Pro	Ala	Phe	Pro	Ala	Val	Leu	Glu	Gln	Thr	Ile	Arg	Asn	Ser		
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Thr	Asn	Thr	Ser	His	Ile	Gln	Ser	Ala	Val	Val	Cys	Gly	Arg	Arg	His		
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ggc	gtc	cgc	ctc	cgc	gtg	cg	agc	ggc	ggc	cac	gac	tac	gag	ggc	ctg	336	
Gly	Val	Arg	Leu	Arg	Val	Arg	Ser	Gly	Gly	Gly	His	Asp	Tyr	Glu	Gly	Leu	
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tcg	tac	cg	tcc	gag	cg	cc	gag	g	tc	gc	gt	ta	gac	ct	aa	384	
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Lys	Met	Arg	Thr	Val	Leu	Val	Asn	Glu	Lys	Ala	Arg	Thr	Ala	Trp	Val		
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gac	tcc	ggc	g	c	g	c	g	tc	tac	tac	gc	atc	gc	aag	aa	480	
Asp	Ser	Gly	Ala	Gln	Leu	Gly	Glu	Leu	Tyr	Tyr	Ala	Ile	Ala	Lys	Asn		
			145			150			155				160				
agc	ccc	gt	ctc	cg	ttc	cc	gc	gg	gtt	tgc	cc	tcc	att	gg	gt	528	
Ser	Pro	Val	Leu	Ala	Phe	Pro	Ala	Gly	Val	Cys	Pro	Ser	Ile	Gly	Val		
			165						170				175				
ggt	ggc	aa	t	tc	g	gc	gg	gc	ttc	gg	at	ct	ct	cg	aag	ta	576
Gly	Gly	Asn	Phe	Ala	Gly	Gly	Gly	Gly	Phe	Gly	Met	Leu	Leu	Arg	Lys	Tyr	
			180			185				190							
ggc	atc	gc	gc	ga	ac	gt	atc	gac	gt	aag	ct	gt	gac	gc	aa	624	
Gly	Ile	Ala	Ala	Glu	Asn	Val	Ile	Asp	Val	Lys	Leu	Val	Asp	Ala	Asn		
			195			200				205							
ggc	aag	ct	ctc	gac	aa	ag	tc	at	g	cc	gac	ca	t	tc	tgg	672	
Gly	Lys	Leu	Leu	Asp	Lys	Ser	Ser	Met	Ser	Pro	Asp	His	Phe	Trp	Ala		
			210			215				220							
gtc	agg	gg	atc	gt	gt	tc	tgg	cag	720								
Val	Arg	Gly	Ser	Phe	Gly	Ile	Val	Val	Trp	Gln							
			225			230					235				240		
gt	aag	ctt	ctc	cc	gt	c	cc	ac	gt	act	gt	ttt	cag	atc	cc	768	
Val	Lys	Leu	Leu	Pro	Val	Pro	Pro	Thr	Val	Thr	Val	Phe	Gln	Ile	Pro		
			245			250				255							
aag	aca	gt	caa	gaa	gg	gc	gt	ac	ct	atc	aa	ag	tgg	cag	ct	816	
Lys	Thr	Val	Gln	Glu	Gly	Ala	Val	Asp	Leu	Ile	Asn	Lys	Trp	Gln	Leu		
			260			265				270							
gtc	gc	cc	gc	ctt	cc	gg	gac	atc	at	atc	cg	atc	atc	gc	at	864	
Val	Ala	Pro	Ala	Leu	Pro	Gly	Asp	Ile	Met	Ile	Arg	Ile	Ile	Ala	Met		
			275			280				285							

ggg gac aaa gcg acg ttc gag gcc atg tac ctg ggc acc tgc aaa acc Gly Asp Lys Ala Thr Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr 290 295 300	912
ctg acg ccg ctg atg agc agc aaa ttc ccg gag ctt ggc atg aac ccc Leu Thr Pro Leu Met Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro 305 310 315 320	960
tcg cac tgc aac gag atg ccc tgg atc aag tcc atc ccc ttc atc cac Ser His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His 325 330 335	1008
ctt ggc aag cag gcc acc ctg gcc gac ctc ctc aac cgg aac aac acc Leu Gly Lys Gln Ala Thr Leu Ala Asp Leu Leu Asn Arg Asn Asn Thr 340 345 350	1056
tcc aaa ccc ttc gcc gaa tac aag tcg gac tac gtc tac cag ccc gtc Phe Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Val 355 360 365	1104
ccc aag ccc gtg tgg gag cag ctc ttc ggc tgg ctc acg aaa ccc ggc Pro Lys Pro Val Trp Glu Gln Leu Phe Gly Trp Leu Thr Lys Pro Gly 370 375 380	1152
gcg ggg atc atg gtc atg gac cca tac ggc gcc acc atc agc gcc acc Ala Gly Ile Met Val Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr 385 390 395 400	1200
ccc gaa gcg gcg acg ccg ttc cct cac cgc aag ggc gtc ctc ttc aac Pro Glu Ala Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn 405 410 415	1248
atc cag tac gtc aac tac tgg ttc gcc gag gca gcc ggc gcc gcg ccg Ile Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Gly Ala Ala Pro 420 425 430	1296
ctg cag tgg agc aag gac att tac aaa ttc atg gag ccg ttc gtg agc Leu Gln Trp Ser Lys Asp Ile Tyr Lys Phe Met Glu Pro Phe Val Ser 435 440 445	1344
aag aac ccc agg cag gcg tac gcc aac tac agg gac atc gac ctc ggc Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly 450 455 460	1392
agg aac gag gtg gtg aac gac atc tca acc tac agc agc ggc aag gtg Arg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val 465 470 475 480	1440
tgg ggc gag aag tac ttc aag ggc aac ttc caa agg ctc gcc atc acc Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr 485 490 495	1488
aag ggc aag gtg gat ccc cag gac tac ttc agg aac gag cag agc atc Lys Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile 500 505 510	1536
ccg ccg ctg ctg ggc aag tag tgaccgagag tcttgcatgg agatttgtag Pro Pro Leu Leu Gly Lys 515	1587
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<211> 518

<212> PRT

<213> Hordeum vulgare

<400> 6

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His His Ala Ala Val Ser Ser Ala Gln Val Pro Ala Lys Asp Asp Phe
20 25 30

Leu Gly Cys Leu Val Lys Glu Ile Pro Ala Arg Leu Leu Phe Ala Lys
35 40 45

Ser Ser Pro Ala Phe Pro Ala Val Leu Glu Gln Thr Ile Arg Asn Ser
50 55 60

Arg Trp Ser Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro
65 70 75 80

Thr Asn Thr Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His
85 90 95

Gly Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu
100 105 110

Ser Tyr Arg Ser Glu Arg Pro Glu Ala Phe Ala Val Val Asp Leu Asn
115 120 125

Lys Met Arg Thr Val Leu Val Asn Glu Lys Ala Arg Thr Ala Trp Val
130 135 140

Asp Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn
145 150 155 160

Ser Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val
165 170 175

Gly Gly Asn Phe Ala Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr
180 185 190

Gly Ile Ala Ala Glu Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn
195 200 205

- 16 -

Gly Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala
210 215 220

Val Arg Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln
225 230 235 240

Val Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Gln Ile Pro
245 250 255

Lys Thr Val Gln Glu Gly Ala Val Asp Leu Ile Asn Lys Trp Gln Leu
260 265 270

Val Ala Pro Ala Leu Pro Gly Asp Ile Met Ile Arg Ile Ile Ala Met
275 280 285

Gly Asp Lys Ala Thr Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr
290 295 300

Leu Thr Pro Leu Met Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro
305 310 315 320

Ser His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His
325 330 335

Leu Gly Lys Gln Ala Thr Leu Ala Asp Leu Leu Asn Arg Asn Asn Thr
340 345 350

Phe Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Val
355 360 365

Pro Lys Pro Val Trp Glu Gln Leu Phe Gly Trp Leu Thr Lys Pro Gly
370 375 380

Ala Gly Ile Met Val Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr
385 390 395 400

Pro Glu Ala Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn
405 410 415

Ile Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Gly Ala Ala Pro
420 425 430

Leu Gln Trp Ser Lys Asp Ile Tyr Lys Phe Met Glu Pro Phe Val Ser
435 440 445

Lys Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly
450 455 460

Arg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val
465 470 475 480

Trp Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr
485 490 495

Lys Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile
500 505 510

Pro Pro Leu Leu Gly Lys
515

<210> 7

<211> 1603

<212> DNA

<213> Triticum aestivum

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<222> (1555)..(1557)

<223>

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<222> (1)..(63)

<223>

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<222> (1)..(21)

<223>

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<222> (1) .. (1557)

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 Asn Tyr Arg Ala Phe Thr Leu Val Leu Leu Phe Cys Ala Leu Ser Cys
 1 5 10 15

 caa gcc gcc gcc acc tac gcg ccg gtg cct gcc aag gag gac ttc ctc 96
 Gln Ala Ala Ala Thr Tyr Ala Pro Val Pro Ala Lys Glu Asp Phe Leu
 20 25 30

 gga tgc ctc atg aag gag ata ccg gca cgc ctc ctc tac gcc aag agc 144
 Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys Ser
 35 40 45

 tcg cct gac ttc ccc acc gtc ctg gcg cag acc atc agg aac tcg cg 192
 Ser Pro Asp Phe Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser Arg
 50 55 60

 tgg ttg tcg ccg cag aac gtg aag ccg ctc tac atc atc acc ccc acc 240
 Trp Leu Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr
 65 70 75 80

 aac gcc tcg cac atc cag tcc gcg gtg gtg tgc gga cgc cgg cac agc 288
 Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser
 85 90 95

 gtc cgc ctc cgc gtc cg 100 105 110
 Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser

 tac cgg tcc gag aaa ccc gag acg ttc gcc gtc gtc gac ctc aac aag 384
 Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys
 115 120 125

 atg cgg gca gtg ttg atc gac ggc tac gcc cgc acg gcg tgg gtc gaa 432
 Met Arg Ala Val Leu Ile Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu
 130 135 140

 tcc ggc gcg cag ctc ggc gag ctc tac tac gcc atc gcg aaa aac agc 480
 Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
 145 150 155 160

 ccc gtg ctc gcg ttc ccg gc 165 170 175
 Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly

 ggc aac ttc gca ggc ggc ttt ggc atg ctg ctg cgg aag tac ggc 528
 Gly Asn Phe Ala Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
 180 185 190

 atc gcc gcc gag aac gtc atc gac gtc aag gtg gtc gac ccc aac ggc 576
 Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn Gly
 195 200 205

 aag ctt ctc gac aag agc tcc atg agc ccg gac cac ttc tgg gcc gtc 624
 Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala Val
 210 215 220

agg ggc ggc ggc gga gag agc ttt ggc atc gtc gtg tcg tgg caa gtg Arg Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val 225 230 235 240	720
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aca gtg caa gaa ggc gcc gta gac ctc gtc aac aag tgg caa ctg gtc Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val 260 265 270	816
ggg ccg gcc ctt ccc ggc gac ctc atg atc cgc gtc atc gct gcg ggg Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly 275 280 285	864
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cac tgc aac gag atg ccc tgg atc aag tcc atc ccc ttc atc cac ctc His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His Leu 325 330 335	1008
ggc aaa gag gcc agc ctg gtc gac ctc ctc aac cg ^g aac acc acc ttc Gly Lys Glu Ala Ser Leu Val Asp Leu Leu Asn Arg Asn Asn Thr Phe 340 345 350	1056
aag ccc ttc gcc gaa tac aag tcg gac tac gtg tac cag ccc ttc ccc Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro 355 360 365	1104
aag ccc gtg tgg gag cag atc ttc ggc tgg ctc acg aag ccc ggt ggg Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Thr Lys Pro Gly Gly 370 375 380	1152
ggg atg atg atc atg gac cca tac ggc gcc acc atc agc gcc acc ccc Gly Met Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro 385 390 395 400	1200
gaa gcg gcg acg ccg ttc cct cac cgc cag ggc gtt ctc ttc aac atc Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile 405 410 415	1248
cag tac gtc aac tac tgg ttc gcc gag gca gcc gcc gcc gcg ccg ctg Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Ala Ala Pro Leu 420 425 430	1296
cag tgg agc aag gac atg tac aat ttc atg gag ccg tac gtg agc aag Gln Trp Ser Lys Asp Met Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys 435 440 445	1344
aac ccc agg cag gcg tac gcc aac tac agg gac att gac ctc ggc agg Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg 450 455 460	1392
aac gag gtg gtg aac gac atc tca acc tat agc agc ggc aag gtt tgg Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp 465 470 475 480	1440

ggc gag aag tac ttc aag ggc aac ttc caa agg ctc gct att acc aag	1488
Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr Lys	
485	490
495	
ggc aag gtg gat cct cag gac tac ttc agg aac gag cag agc atc ccg	1536
Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro	
500	505
510	
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Pro Leu Leu Glu Lys Tyr	
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Gly Cys Leu Met Lys Glu Ile Pro Ala Arg Leu Leu Tyr Ala Lys Ser	
35	40
	45
Ser Pro Asp Phe Pro Thr Val Leu Ala Gln Thr Ile Arg Asn Ser Arg	
50	55
	60
Trp Leu Ser Pro Gln Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr	
65	70
	75
	80
Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser	
85	90
	95
Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser	
100	105
	110
Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys	
115	120
	125
Met Arg Ala Val Leu Ile Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu	
130	135
	140

Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
145 150 155 160

Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly
165 170 175

Gly Asn Phe Ala Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
180 185 190

Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asn Gly
195 200 205

Lys Leu Leu Asp Lys Ser Ser Met Ser Pro Asp His Phe Trp Ala Val
210 215 220

Arg Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val
225 230 235 240

Lys Leu Leu Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys
245 250 255

Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val
260 265 270

Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly
275 280 285

Asn Thr Ala Thr Phe Glu Gly Met Tyr Leu Gly Thr Cys Gln Thr Leu
290 295 300

Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr
305 310 315 320

His Cys Asn Glu Met Pro Trp Ile Lys Ser Ile Pro Phe Ile His Leu
325 330 335

Gly Lys Glu Ala Ser Leu Val Asp Leu Leu Asn Arg Asn Asn Thr Phe
340 345 350

Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
355 360 365

Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Thr Lys Pro Gly Gly
370 375 380

Gly Met Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385 390 395 400

Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
405 410 415

Gln Tyr Val Asn Tyr Trp Phe Ala Glu Ala Ala Ala Ala Ala Pro Leu
420 425 430

Gln Trp Ser Lys Asp Met Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys
435 440 445

Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
450 455 460

Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465 470 475 480

Gly Glu Lys Tyr Phe Lys Gly Asn Phe Gln Arg Leu Ala Ile Thr Lys
485 490 495

Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
500 505 510

Pro Leu Leu Glu Lys Tyr
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<210> 9

<211> 1603

<212> DNA

<213> Triticum aestivum

<220>

<221> stop_codon

<222> (1555)..(1557)

<223>

<220>

<221> CDS

<222> (1)..(1557)

<223>

<220>

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atc gcc gcc gag aac gtc atc gac gtc aag gtg gtc gac ccc gac ggc Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asp Gly 195 200 205	624
aag ctg ctc gac aag agc tcc atg agc gcg gac cac ttc tgg gcc gtc Lys Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe Trp Ala Val 210 215 220	672
agg ggc ggc ggc gga gag agc ttc ggc atc gtc gtc tcg tgg cag gtg Arg Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val 225 230 235 240	720
aag ctc atg cca gtg cct ccc acc gtc acc gtg ttt aag atc ccc aag Lys Leu Met Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys 245 250 255	768
acg gtg caa gaa ggc gcc gta gac ctc gtc aac aag tgg cag ctg gtc Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val 260 265 270	816
ggg ccg gca ctt ccc ggc gac ctc atg atc cgc gtc atc gct gcc ggg Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly 275 280 285	864
aac acg gcg acg ttc gag gcc ttg tac ctg ggc acc tgc aaa acc ctg Asn Thr Ala Thr Phe Glu Ala Leu Tyr Leu Gly Thr Cys Lys Thr Leu 290 295 300	912
acg ccg ctg atg agc agc caa ttc ccc gag ctt ggc atg aac ccc tat Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr 305 310 315 320	960
cac tgc aac gag atg ccc tgg atc aag tcc gtc ccc ttc atc cac ctc His Cys Asn Glu Met Pro Trp Ile Lys Ser Val Pro Phe Ile His Leu 325 330 335	1008
ggc aaa cag gct ggc ctg gac gac ctc ctc aac cg ^g aac aac acc ttc Gly Lys Gln Ala Gly Leu Asp Asp Leu Leu Asn Arg Asn Asn Thr Phe 340 345 350	1056
aag ccc ttc gcc gaa tac aag tcg gac tac gtg tac cag ccc ttc ccc Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro 355 360 365	1104
aag ccc gtg tgg gag cag atc ttc ggc tgg ctc gcg aag ccc ggc gcg Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Ala Lys Pro Gly Ala 370 375 380	1152
ggg atc atg atc atg gac ccc tac ggc gcc acc atc agc gcc acc ccc Gly Ile Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro 385 390 395 400	1200
gaa gcg gcg acg ccg ttc cct cac cgc cag ggc gtc ctc ttc aac atc Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile 405 410 415	1248

- 25 -

Asn Ala Ser His Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Gly
85 90 95

Val Arg Leu Arg Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser
100 105 110

Tyr Arg Ser Glu Lys Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys
115 120 125

Met Arg Ala Val Val Val Asp Gly Tyr Ala Arg Thr Ala Trp Val Glu
130 135 140

Ser Gly Ala Gln Leu Gly Glu Leu Tyr Tyr Ala Ile Ala Lys Asn Ser
145 150 155 160

Pro Val Leu Ala Phe Pro Ala Gly Val Cys Pro Ser Ile Gly Val Gly
165 170 175

Gly Asn Phe Ala Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly
180 185 190

Ile Ala Ala Glu Asn Val Ile Asp Val Lys Val Val Asp Pro Asp Gly
195 200 205

Lys Leu Leu Asp Lys Ser Ser Met Ser Ala Asp His Phe Trp Ala Val
210 215 220

Arg Gly Gly Gly Glu Ser Phe Gly Ile Val Val Ser Trp Gln Val
225 230 235 240

Lys Leu Met Pro Val Pro Pro Thr Val Thr Val Phe Lys Ile Pro Lys
245 250 255

Thr Val Gln Glu Gly Ala Val Asp Leu Val Asn Lys Trp Gln Leu Val
260 265 270

Gly Pro Ala Leu Pro Gly Asp Leu Met Ile Arg Val Ile Ala Ala Gly
275 280 285

Asn Thr Ala Thr Phe Glu Ala Leu Tyr Leu Gly Thr Cys Lys Thr Leu
290 295 300

Thr Pro Leu Met Ser Ser Gln Phe Pro Glu Leu Gly Met Asn Pro Tyr
305 310 315 320

His Cys Asn Glu Met Pro Trp Ile Lys Ser Val Pro Phe Ile His Leu
325 330 335

Gly Lys Gln Ala Gly Leu Asp Asp Leu Leu Asn Arg Asn Asn Thr Phe
340 345 350

Lys Pro Phe Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro
355 360 365

Lys Pro Val Trp Glu Gln Ile Phe Gly Trp Leu Ala Lys Pro Gly Ala
370 375 380

Gly Ile Met Ile Met Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro
385 390 395 400

Glu Ala Ala Thr Pro Phe Pro His Arg Gln Gly Val Leu Phe Asn Ile
405 410 415

Gln Tyr Val Asn Tyr Trp Phe Ala Glu Pro Ala Gly Ala Ala Pro Leu
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Gln Trp Ser Lys Asp Ile Tyr Asn Phe Met Glu Pro Tyr Val Ser Lys
435 440 445

Asn Pro Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg
450 455 460

Asn Glu Val Val Asn Asp Ile Ser Thr Tyr Ser Ser Gly Lys Val Trp
465 470 475 480

Gly Glu Lys Tyr Phe Lys Ser Asn Phe Gln Arg Leu Ala Ile Thr Lys
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Gly Lys Val Asp Pro Gln Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro
500 505 510

Pro Leu Ile Glu Lys Tyr
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<212> DNA

<213> Phleum pratense

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<223>

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 aaa gaa atc ccg ccg cgt ctg ttg tac gcg aaa tcg tcg ccg gcg tat 96
 Lys Glu Ile Pro Pro Arg Leu Leu Tyr Ala Lys Ser Ser Pro Ala Tyr
 20 25 30

 ccc tca gtc ctg ggg cag acc atc cg^g aac tcg agg tgg tcg tcg ccg 144
 Pro Ser Val Leu Gly Gln Thr Ile Arg Asn Ser Arg Trp Ser Ser Pro
 35 40 45

 gac aac gtg aag ccg ctc tac atc atc acc ccc acc aac gtc tcc cac 192
 Asp Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr Asn Val Ser His
 50 55 60

 atc cag tcc gcc gtg gtg tgc ggc cgc cgc cac agc gtc cgc atc cgc 240
 Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser Val Arg Ile Arg
 65 70 75 80

 gtg cgc agc ggc ggg cac gac tac gag ggc ctc tcg tac cgg tct ttg 288
 Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser Tyr Arg Ser Leu
 85 90 95

 cag ccc gag acg ttc gcc gtc gtc gac ctc aac aag atg cgg gcg gtg 336
 Gln Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys Met Arg Ala Val
 100 105 110

 tgg gtg gac ggc aag gcc cgc acg gcg tgg gtg gac tcc ggc gcg cag 384
 Trp Val Asp Gly Lys Ala Arg Thr Ala Trp Val Asp Ser Gly Ala Gln
 115 120 125

 ctc ggc gag ctc tac tac gcc atc tat aag gcg agc ccc acg ctg gcg 432
 Leu Gly Glu Leu Tyr Tyr Ala Ile Tyr Lys Ala Ser Pro Thr Leu Ala
 130 135 140

 ttc ccg gcc ggc gtg tgc ccg acg atc gga gtg ggc ggc aac ttc gcg 480
 Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly Gly Asn Phe Ala
 145 150 155 160

 ggc ggc ggc ttc ggc atg ctg ctg cgc aag tac ggc atc gcc gcg gag 528
 Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly Ile Ala Ala Glu
 165 170 175

 aac gtc atc gac gtg aag ctc gtc gac gcc aac ggc aag ctg cac gac 576
 Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn Gly Lys Leu His Asp
 180 185 190

 aag aag tcc atg ggc gac gac cat ttc tgg gcc gtc agg ggc ggc ggg 624
 Lys Lys Ser Met Gly Asp Asp His Phe Trp Ala Val Arg Gly Gly Gly
 195 200 205

 ggc gag agc ttc ggc atc gtg gtc gcg tgg cag gtg aag ctc ctg ccg 672
 Gly Glu Ser Phe Gly Ile Val Val Ala Trp Gln Val Lys Leu Leu Pro

210	215	220	
gtg ccg ccc acc gtg aca ata ttc aag atc tcc aag aca gtg agc gag Val Pro Pro Thr Val Thr Ile Phe Lys Ile Ser Lys Thr Val Ser Glu			720
225	230	235	240
ggc gcc gtg gac atc atc aac aag tgg caa gtg gtc gcg ccg cag ctt Gly Ala Val Asp Ile Ile Asn Lys Trp Gln Val Val Ala Pro Gln Leu			768
245	250	255	
ccc gcc gac ctc atg atc cgc atc atc gcg cag ggg ccc aag gcc acg Pro Ala Asp Leu Met Ile Arg Ile Ile Ala Gln Gly Pro Lys Ala Thr			816
260	265	270	
ttc gag gcc atg tac ctc ggc acc tgc aaa acc ctg acg ccg ttg atg Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr Leu Thr Pro Leu Met			864
275	280	285	
agc agc aag ttc ccg gag ctc ggc atg aac ccc tcc cac tgc aac gag Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro Ser His Cys Asn Glu			912
290	295	300	
atg tca tgg atc cag tcc atc ccc ttc gtc cac ctc ggc cac agg gac Met Ser Trp Ile Gln Ser Ile Pro Phe Val His Leu Gly His Arg Asp			960
305	310	315	320
gcc ctc gag gac ctc ctc aac cgg aac aac tcc ttc aag ccc ttc Ala Leu Glu Asp Asp Leu Leu Asn Arg Asn Asn Ser Phe Lys Pro Phe			1008
325	330	335	
gcc gaa tac aag tcc gac tac gtc tac cag ccc ttc ccc aag acc gtc Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro Lys Thr Val			1056
340	345	350	
tgg gag cag atc ctc aac acc tgg ctc gtc aag ccc ggc gcc ggg atc Trp Glu Gln Ile Leu Asn Thr Trp Leu Val Lys Pro Gly Ala Gly Ile			1104
355	360	365	
atg atc ttc gac ccc tac ggc gcc acc atc agc gcc acc ccg gag tcc Met Ile Phe Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro Glu Ser			1152
370	375	380	
gcc acg ccc ttc cct cac cgc aag ggc gtc ctc ttc aac atc cag tac Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn Ile Gln Tyr			1200
385	390	395	400
gtc aac tac tgg ttc gcc ccg gga gcc gcc gcg ccc ctc tcg tgg Val Asn Tyr Trp Phe Ala Pro Gly Ala Ala Ala Pro Leu Ser Trp			1248
405	410	415	
agc aag gac atc tac aac tac atg gag ccc tac gtg agc aag aac ccc Ser Lys Asp Ile Tyr Asn Tyr Met Glu Pro Tyr Val Ser Lys Asn Pro			1296
420	425	430	
agg cag gcg tac gca aac tac agg gac atc gac ctc ggc agg aac gag Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg Asn Glu			1344
435	440	445	
gtg gtc aac gac gtc tcc acc tac gcc agc ggc aag gtc tgg ggc cag Val Val Asn Asp Val Ser Thr Tyr Ala Ser Gly Lys Val Trp Gly Gln			1392
450	455	460	
aaa tac ttc aag ggc aac ttc gag agg ctc gcc att acc aag ggc aag			1440

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Lys Tyr Phe Lys Gly Asn Phe Glu Arg Leu Ala Ile Thr Lys Gly Lys
465 470 475 480

gtc gat cct acc gac tac ttc agg aac gag cag agc atc ccg ccg ctc 1488
Val Asp Pro Thr Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro Pro Leu
485 490 495

atc aaa aag tac tga 1503
Ile Lys Lys Tyr
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<213> Phleum pratense

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Tyr Phe Pro Pro Pro Ala Ala Lys Glu Asp Phe Leu Gly Cys Leu Val
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Lys Glu Ile Pro Pro Arg Leu Leu Tyr Ala Lys Ser Ser Pro Ala Tyr
20 25 30

Pro Ser Val Leu Gly Gln Thr Ile Arg Asn Ser Arg Trp Ser Ser Pro
35 40 45

Asp Asn Val Lys Pro Leu Tyr Ile Ile Thr Pro Thr Asn Val Ser His
50 55 60

Ile Gln Ser Ala Val Val Cys Gly Arg Arg His Ser Val Arg Ile Arg
65 70 75 80

Val Arg Ser Gly Gly His Asp Tyr Glu Gly Leu Ser Tyr Arg Ser Leu
85 90 95

Gln Pro Glu Thr Phe Ala Val Val Asp Leu Asn Lys Met Arg Ala Val
100 105 110

Trp Val Asp Gly Lys Ala Arg Thr Ala Trp Val Asp Ser Gly Ala Gln
115 120 125

Leu Gly Glu Leu Tyr Tyr Ala Ile Tyr Lys Ala Ser Pro Thr Leu Ala
130 135 140

Phe Pro Ala Gly Val Cys Pro Thr Ile Gly Val Gly Gly Asn Phe Ala
145 150 155 160

Gly Gly Gly Phe Gly Met Leu Leu Arg Lys Tyr Gly Ile Ala Ala Glu
165 170 175

Asn Val Ile Asp Val Lys Leu Val Asp Ala Asn Gly Lys Leu His Asp
180 185 190

Lys Lys Ser Met Gly Asp Asp His Phe Trp Ala Val Arg Gly Gly Gly
195 200 205

Gly Glu Ser Phe Gly Ile Val Val Ala Trp Gln Val Lys Leu Leu Pro
210 215 220

Val Pro Pro Thr Val Thr Ile Phe Lys Ile Ser Lys Thr Val Ser Glu
225 230 235 240

Gly Ala Val Asp Ile Ile Asn Lys Trp Gln Val Val Ala Pro Gln Leu
245 250 255

Pro Ala Asp Leu Met Ile Arg Ile Ile Ala Gln Gly Pro Lys Ala Thr
260 265 270

Phe Glu Ala Met Tyr Leu Gly Thr Cys Lys Thr Leu Thr Pro Leu Met
275 280 285

Ser Ser Lys Phe Pro Glu Leu Gly Met Asn Pro Ser His Cys Asn Glu
290 295 300

Met Ser Trp Ile Gln Ser Ile Pro Phe Val His Leu Gly His Arg Asp
305 310 315 320

Ala Leu Glu Asp Asp Leu Leu Asn Arg Asn Asn Ser Phe Lys Pro Phe
325 330 335

Ala Glu Tyr Lys Ser Asp Tyr Val Tyr Gln Pro Phe Pro Lys Thr Val
340 345 350

Trp Glu Gln Ile Leu Asn Thr Trp Leu Val Lys Pro Gly Ala Gly Ile
355 360 365

Met Ile Phe Asp Pro Tyr Gly Ala Thr Ile Ser Ala Thr Pro Glu Ser
370 375 380

Ala Thr Pro Phe Pro His Arg Lys Gly Val Leu Phe Asn Ile Gln Tyr
385 390 395 400

Val Asn Tyr Trp Phe Ala Pro Gly Ala Ala Ala Ala Pro Leu Ser Trp
405 410 415

Ser Lys Asp Ile Tyr Asn Tyr Met Glu Pro Tyr Val Ser Lys Asn Pro
420 425 430

Arg Gln Ala Tyr Ala Asn Tyr Arg Asp Ile Asp Leu Gly Arg Asn Glu
435 440 445

Val Val Asn Asp Val Ser Thr Tyr Ala Ser Gly Lys Val Trp Gly Gln
450 455 460

Lys Tyr Phe Lys Gly Asn Phe Glu Arg Leu Ala Ile Thr Lys Gly Lys
465 470 475 480

Val Asp Pro Thr Asp Tyr Phe Arg Asn Glu Gln Ser Ile Pro Pro Leu
485 490 495

Ile Lys Lys Tyr
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<213> Dactylus glomerata

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<212> PRT

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Val Asp Pro Thr Asp Tyr Phe Gly Asn Glu Gln
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Ala Arg Thr Ala Trp Val Asp Ser Gly Ala Gln Leu Gly Glu Leu Ser
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Tyr

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Gln Leu Tyr Leu Lys Ser
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<211> 24

<212> PRT

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1 5 10 15

Val Asp Ala Gln Gly Arg Leu Leu
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<210> 22

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1 5 10 15

Met Thr Pro Tyr Val Ser Lys Asn Pro Arg Gln Ala Tyr Val Asn Tyr
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Arg Asp Leu Asp
35

<210> 28

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Phe Leu Glu Pro Val Leu Gly Leu Ile Phe Pro Ala Gly Val
1 5 10

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Gly Leu Ile Glu Phe Pro Ala Gly Val
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